

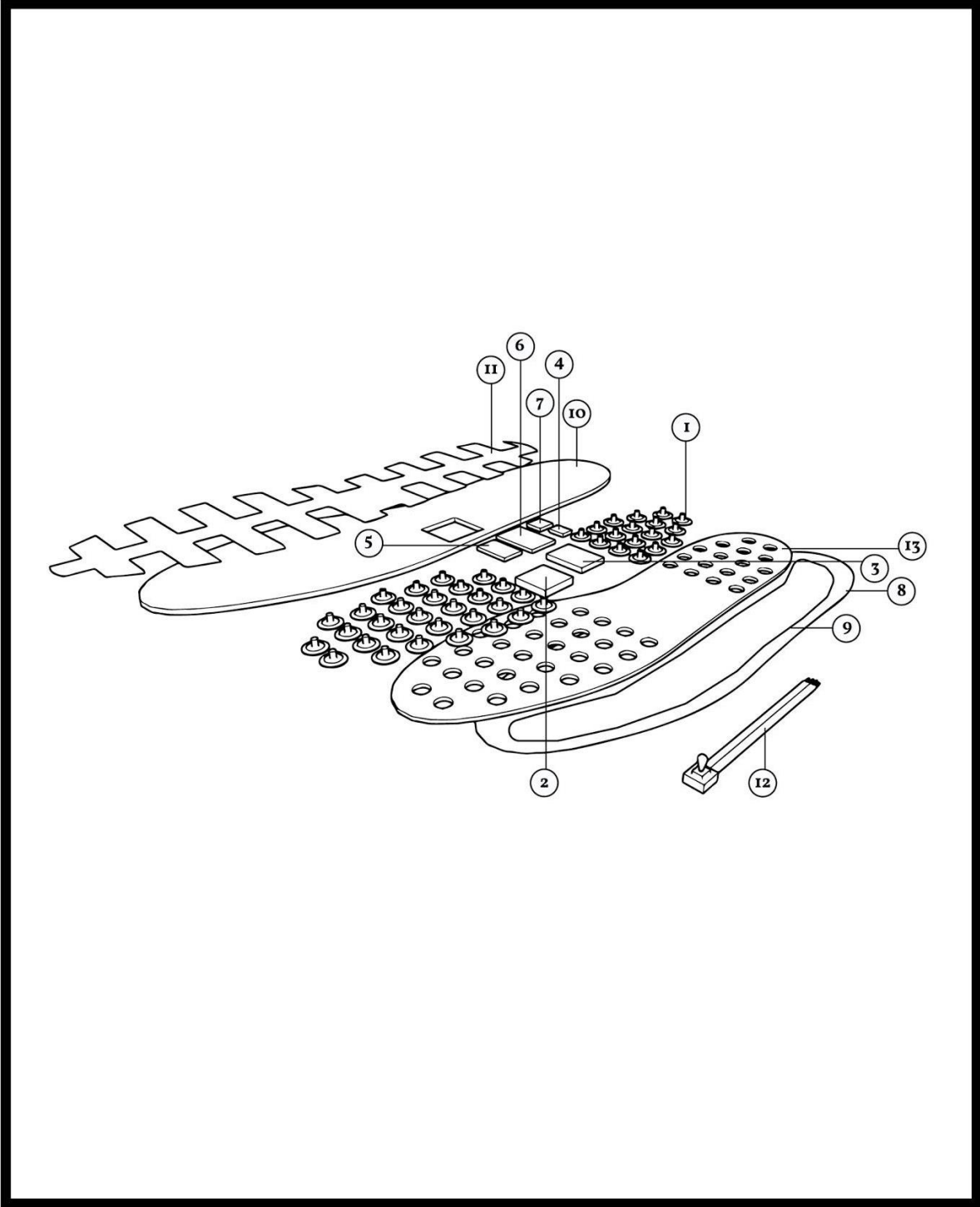
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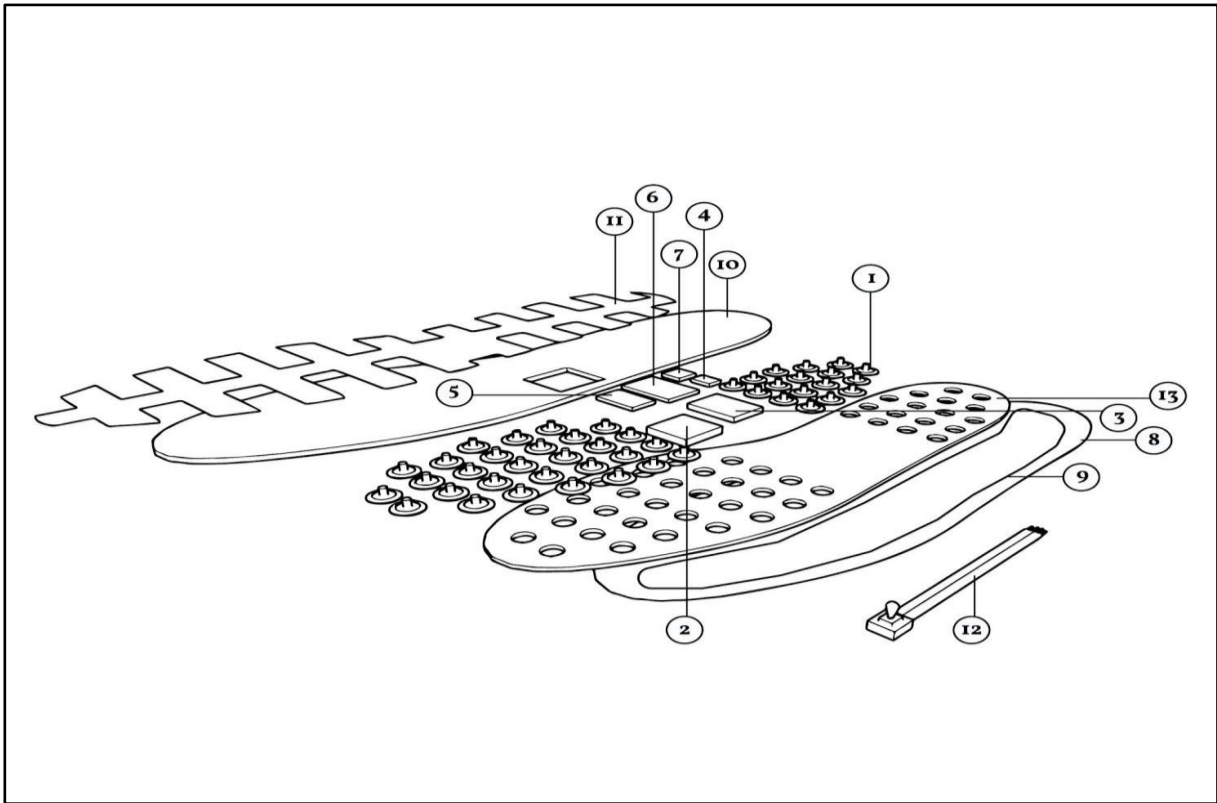
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ABOUT THE COVER



The cover features an exploded view of the developed self-powered thermoregulating insole. The insole is composed of different specialized subsystems capable of safely regulating the temperature of the foot while harvesting its mechanical energy upon impact to power itself without any external conventional power source. The developed prototype has vast implications upon fossil fuel burning and air-conditioning system usage reduction which may, one day, revolutionize the footwear industry and save the environment. Above all, however, the prototype serves as a model, as an inspiration, and as a reminder, that we have the power to empower ourselves too. Like the insole capable of supplying energy to itself by converting mechanical energy into thermal energy, the change for the betterment of our world we are looking for lies in the untapped capabilities of our own inquisitive minds. We, ourselves, have the power to provide the advancements we are waiting for. There just needs to be a way of extracting these ideas, and there is no better way than the scientific method through research.

About PSHS



MISSION

The Philippine Science High School, operating under one System of Governance and Management, provides scholarship to students with high aptitude in science and mathematics.

The PSHS System offers an education that is humanistic in spirit, global in perspective, and patriotic in orientation. It is based on a curriculum that emphasizes science and mathematics and the development of well-rounded individuals.

The PSHS System prepares its students for careers in Science and Technology and contributes to nation building by helping the country attain a critical mass of professionals and leaders in Science and Technology.



VISION

We are the leading science high school in the Asia Pacific Region preparing our scholars to become globally competitive Filipino scientists equipped with 21st century skills and imbued with the core values of truth, excellence, and service to nation.



MANDATE

The Philippine Science High School System is a service institute of the Department of Science and Technology (DOST) whose mandate is to offer scholarship in secondary education with special emphasis on subjects pertaining to the sciences to prepare its students for a science career (R.A. 3661). Its primary function is to administer the country's scholarship program in special science secondary education.

Be a PSHS Scholar today!

Requirements for Eligibility

grades of at least

85

in S&T subjects

certified Filipino citizen



w/ no pending app.

must not be younger than

**EXACTLY
12 Y.O.**

at August 1 of the new school year

have a satisfactory rating or its equivalent in report card



NOT HAVE TAKEN THE NCE BEFORE

Application Requirements



Perks of Being A PSHS Scholar



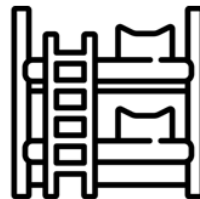
free tuition



free books



monthly allowance
up to PHP 4500



dorm lodging



uniform transpo living allowance
for low income families

more info at: pshs.wvc.edu.ph

FOREWORD

Science and Technology Research (STR) is one challenging part of the PSHS curriculum. Scholars' research knowledge and skills are put into practice and application. In order for them to successfully hurdle the Research Program and complete their projects, their character is put to test and is honored as they experience the value of collaboration, patience, diligence and perseverance. STR for sure entails hard work, but definitely is worth going through as a PSHS scholar. This Publiscience is a collection of the research projects of Batch 2019, and shall serve as a testament of their well-deserved prize for their hard work. Congratulations Batch 2019!

SHENA FAITH M. GANELA, Ph. D.

Campus Director

My warmest Congratulations to Grade 12, Batch 2019! You have made it with flying colors because you did not give up. You did not simply settle in finishing your research work but rather raise the bar of expectations by publishing your research in a journal. Thus far, this is really one of a kind output that is worthy of praise and emulation.

I have witnessed how you work relentlessly to finish your research. I saw how you suffered in silence when your letter of request was left unsigned if not returned for corrections or revisions. You have stretched your patience in encoding your test results, how you patiently waited for your research teachers or your experts to read and return your drafts.

Now, all's well that ends well indeed. Your pride and confidence to share your research masterpiece not only within the realm of our school community but to the public through the journal Publiscience are manifestations of your pursuit of truth and excellence, the mark of a true scholar.

Again, my congratulations for a job well-done.

ROLANDO S. LIBUTAQUE, Ph. D.

Chief, Curriculum Instruction Division

It is every scientist's desire to have their researches published and utilized by the community. This is also the vision of PSHSWVC Research Unit for its students who are honed to become the future Filipino scientists. Publiscience is the culmination of their 3-year Research experience. It is a training ground for research publication. This may not yet be at the level of high impact factor peer-reviewed journals, but this is proudly a student-directed and managed publication. May this serve as a motivation to keep on exploring various scientific endeavours that will help our fellow Filipinos.

HAROLD P. MEDIODIA

Research Unit Head

RESEARCH PROGRAM

The Research Curriculum of the Philippine Science High School System starts during the Grade 10 and continues through the Specialization Year Program (SYP) until the final year, Grade 12.

Research 1

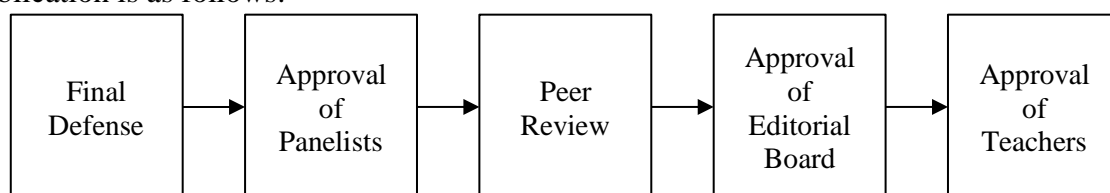
The Research 1 subject tackles the research process as how a study is formulated, conducted, and shared. The curriculum starts with the discussion of the Research Process as a whole and goes into depth on Topic Selection, Presentation, and Literature Search, and Research Design. The students are then made to form a group and conduct their project implementations and analysis of data gathered. Paper writing of the different parts of the manuscript were also discussed and Paper Revision was done. At the end of Research 3, a presentation and critiquing was done which is called Pangsugidadon.

Research 2

Research 2 course curriculum includes a review of Research I topics and concepts, and writing of new research proposals. Preliminary investigation and testing are done during the project planning to ensure feasibility of the research study, and a research proposal defense is held. When a proposed project is approved, project implementation and management is then started. By the end of project implementation, analysis and presentation of gathered data is discussed and a research paper is written. Project pitching about the research paper is done and the curriculum is concluded during an event for oral defense of the research paper.

Research 3

Research 3 is about the finishing touches of research; Paper Writing, Research Sharing, and Publishing. Students are to finish writing their manuscripts and have this reviewed by their respective Research Adviser, Research Teacher and Research Unit Head, then they will present their studies in an Oral Presentation, termed Pagbantala, and defend their study in a Final Defense. Research 3 also requires the sharing of your research studies to different audiences such as Project Pitching to people outside of the campus, Poster Presentation (Pagbalandra) to the Grades 7-11, and Poster/Oral Presentation (Pagwaragwag) in a community research fair that they organized. Researchers will also be made to conduct seminar-workshops and mentoring activities, to the lower years of PSHS-WVC to impart knowledge on their field or study and research as a whole. Finally, the students will have to make their journal-ready papers for publishing in the school's very own journal, Publiscience. The review process for publication is as follows:



The **Research Committee** of Philippine Science High School Western Visayas is the primary reviewers of all research projects produced by the students. It is headed by the Research Unit Head who oversees and approves all research work. The Research Teachers are assigned to handle the Research class for that specific year and grade level. The Research Advisers, having deeper knowledge of a specific field, guide their advisees throughout their research journey while monitoring their progress.

RESEARCH COMMITTEE

RESEARCH UNIT HEAD

Harold P. Mediodia

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Zennifer L. Oberio

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Gerald U. Salazar

Ramon Angelo N. Sinco

Alberto G. Tanoy

Raphael Eric C. Yturralde

Fernando Christian G. Jolito III

LIST OF REVIEWERS AND PANELISTS

Pangsugidadon, derived from the word “sugid” meaning “to tell,” is the title of the research event in which grade 10 students present their study's findings to a panel which is composed of three to four panelists per cluster. The panel is composed of a combination of a member of the PSHS-WVC Research Committee, a Specialization Year Program (SYP) scholar as peer reviewer and an external panelist.

PANGSUGIDADON

EXTERNAL PANELISTS

Johannes Magpusao

Dominique Mediodia

Melissa Gabriel - Siena

University of the Philippines in the Visayas

Kristelle Yturralde

Department of Science & Technology 6

Justin Brian Chiongson

University of San Agustin

Celaida Gayle Gumban

Ghent University

Fretzie Gay Salazar

Philippine National Police

Paolo Cabañero

Western Institute of Technology

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Josephine Cordero

Erika Eunice Salvador

Xavier Romy Braña

Aris Larroder

Athenes Joy Presno-Aban

Joselle Golingay

Zennifer Oberio

INTERNAL PANELISTS (PEER REVIEWERS)

Regine Bastareche

Fern Rose Peregrino

Deanne Alcalde

Joan Catolico

Cherry Dale Templonuevo

Alexandra Marie Sombiro

Juan Paolo Lorenzo Gerardo Barrios

Pagbantala, derived from the word “bantala” which means “to announce,” is the title given to the oral presentation of the various research studies to a panel of experts composed of one faculty member of the PSHS, one PSHS Alumni, and one External Panelist with expertise on the cluster they were assigned. The 32 work units were grouped into 8 clusters (Microbiology, Marine Biology, Plant Biology, Toxicity Studies, Material Science, Physics & Computer Science, Biochemistry, Chemistry).

PAGBANTALA

EXTERNAL PANELISTS

Genevieve Aponte
Capiz National High School

Antonette Donato
DOST - Aklan

Catherine May Erazo
Oton National High School

Ian John Galupar
Pavia National High School

Dhaniel Mark Layawon
Lambunao National High School

Emily Singbenco
Assumption Iloilo

Leonilo Endoma, Jr.
University of San Agustin

Hemmie Hapin
Iloilo National High School

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Cathrina Bagarinao
Norwell Brian Bautista
Lilcah Opiña
University of the Philippines in the Visayas

Demy Catedral
Southeast Asian Fisheries Devt Center

Eunice Raiza Panagsagan
DOST - Aklan

Kent Michael Solacito
Tech Inno Crafter

Aubrey Eslita
University of the Philippines in Diliman

INTERNAL PANELISTS (FACULTY MEMBERS)

Mialo Bautista

Eisen Ed Briones

Fernando Christian Jolito

David Bryan Lao

Virna Jane Navarro

Angelo Olvido

Erika Eunice Salvador

Ramon Angelo Sinco

Research Final Defense was the final presentation of the research study conducted, which decides the approval of the paper at hand. Each of the 32 work units are required to defend their research paper to the panelists of their choice. The panel was composed of two Internal Panelists who are faculty members of the PSHS, and one External Expert.

FINAL DEFENSE

EXTERNAL PANELISTS

Norwell Brian Bautista
Marie Johanna Cuadra
Laureen Manalo
Marie Frances Nievaes
Resureccion Sadaba
University of the Philippines in the Visayas

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Bureau of Fisheries & Aquatic Resources

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Commission on Audit - VI

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Ranel Abellar

Andrea Lucyle Bela-ong

Xavier Romy Brana

Josephine Cordero

Oliver Fuentespina

Rowena Labrador

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David Bryan Lao

Julnafe Libo-on

Catherine Joy Mediodia

Harold Mediodia

Virna Jane Navarro

Maria Milagrosa Nulla

Angelo Olvido

Zennifer Oberio

Michael Patrick Padernal

Gerald Salazar

Ramon Angelo Sinco

Jose Vicente Tan

Raphael Eric Yturralde

Fernando Christian Jolito III

TABLE OF CONTENTS

- i. About the Cover
- ii. Foreword
- iii. Research Program
- iv. Research Committee
- v. List of Reviewers and Panelists
 - Pangsugidadon
 - Pagbantala
 - Final Defense
- vi. About PSHS
- vii. Preface
- viii. Dedication

I. Agriculture and Aquaculture

- Antifungal activity of *Allium spp.* root exudates on spore germination of *Fusarium oxysporum* f. sp. *cubense* (Alogon, Horlador, Martinete, & Mediodia).....3
- Pollen sources of *Apis mellifera* in select apiaries in Molo, Iloilo and Buenavista, Guimaras (Laurea, Juntarciego, Serilo, & Mediodia).....7
- Improving the growth of cherry tomatoes (*Solanum lycopersicum L. var. cerasiforme*) using irradiated carrageenan (Pamati-an, Miraflores, Galino, & Oberio).....13
- Growth performance of *Trachinotus blochii* (silver pompano) fed with commercial meal substituted with different levels of *Moringa oleifera* (malunggay) leaf (Biray, Menchavez, Almaquer, & Libo-on).....19
- Piscicidal effects of *Pachyrhizus erosus* (yam bean) seed extracts (Pasquin, Rodrigo, Villaluna, & Aban).....23
- Immune response of *Litopenaeus vannamei* juveniles immersed in *Gracilariopsis heteroclada* hot-water extracts (Yap, Bungay, Alfonso, Sinco, Libo-on, & Cordero).....29

II. Climate Change Adaptation 35

- Determination of reflectivity of concrete slabs applied with paint with powdered *Placuna placenta* shell additive (Apton, Frange, Salistre, & Larroder).....37

III. Health 43

- Determining the bacterial content of fresh and cooked sea cucumbers used for food consumption in Panobolon Island, Nueva Valencia, Guimaras (Aguado, Aro, Lomigo, & Mediodia).....45
- Effect of UV radiation (365nm) to production of antimutagenic compounds in *Arachis hypogaea* (peanut) roots (Abellar, De Juan, & Belaong).....51
- Biofilm dispersal effects of Fenton's reagent on *Staphylococcus aureus* biofilm (Andrada, Javellana, Licup, & Belaong).....57
- The antibiofilm activity of ethanol peel extracts of different *Mangifera indica L.* (Carabao mango) ripeness stages against *Staphylococcus aureus* biofilm (Bat-og, Oreta, Villafior, & Jolito).....63

An exploratory study on the anti-angiogenic property of <i>Ficus benjamina</i> crude methanolic leaf extract using duck (<i>Anas platyrhynchos</i>) chorioallantoic membrane (CAM) assay (Cainglet, Carnaje, Yanson, & Aban).....	69
Larvicidal activity of individual and combined ethanolic extracts of <i>Annona muricata</i> seed and <i>Piper betle</i> leaf against <i>Aedes aegypti</i> (Grande, Balmaceda, Tanena, & Mediodia).....	73
Antibacterial properties of <i>Dioscorea alata</i> (purple yam) peel extracts against selected gram-negative and gram-positive bacteria (Grantoza, Mationg, Seguano, & Oberio).....	77
Evaluation of alanine-silver nanocomposites from biosynthesized silver nanoparticles (Loot, Nunag, Rabino, & Larroder).....	83
The effects of acetyl l-carnitine on the prevention of platelet storage lesions (Maquiling, Villanueva, & Oberio).....	89
Evaluation of the antioxidant activity of <i>Annona muricata</i> (Guyabano) silver nanoparticles and <i>Annona muricata</i> ethanolic leaf extract (Sobretudo, Jaen, Villalobos, & Sinco).....	95
IV. Industry, Energy, and Emerging Technologies	101
Effect of angle increments and morphological complexity on the application of photogrammetry on the shells of <i>Turbo crassus</i> , <i>Angaria delphinus</i> , and <i>Thais aculeata</i> (Arroyo, Gervero, Nulla, & Oberio).....	103
Porous ceramic modified with hydrous manganese oxide as potential sorbent of cadmium and lead in water (Cruz, Libiano, Bacongallo, Sinco, & Bautista).....	107
Influences of dye pH on the efficiency of dye-sensitized solar cells using natural dye extracted from blue ternate (<i>Clitoria ternatea</i>) (Esterá, Sorongon, Martínez, & Larroder)...	113
Development of gait-powered active thermoregulatory insole using thermoelectric module (TEC) powered by lead zirconate titanate (PZT) piezoelectric discs (Geraldez, Cawaling, & Villegas).....	119
Comparison of the cavitation activity of ethanol and acetic acid as ultrasonic cleaning solution (Imbang, Macadangdang, Sara, & Nulla).....	125
Fygo: an automated dormitory leave pass mobile application for Philippine Science High School - Western Visayas dormitories using Thunkable (Roxas, Subong, Fuentes, Salazar, & Briones).....	129
V. Natural Resources and Environment	135
Determining the tensile strength, tear resistance, and stiffness of <i>Adonidia merrillii</i> (Manila Palm Tree) leaf sheaths (Aguilar, Lignig, Togonon, Brana, & Tanoy).....	137
DNA barcoding of molluscs (class: <i>Bivalvia</i>) in selected sites in Capiz, Philippines (Areno, Cambel, Hilapad, Belaong, Castillo, & Valdez).....	143
Accumulation of cadmium and lead in <i>Enhalus acoroides</i> (tape seagrass) species in Brgy. Alegria, Semirara Island, Caluya, Antique, Philippines (Castillon, Ambut, Tindan, & Mediodia).....	149
Comparison of phytoplankton abundance and diversity in selected sites along Iloilo Guimaras Strait near Panay Energy Development Corporation coal-fired power plant (Occena, Cordova, Demandante, & Belaong).....	153

Interaction between *Rhodobacter sphaeroides* and Harmful Algal Bloom (HAB) causing
dinoflagellate, *Amphidinium carterae* (Serra, Cabalfin, Lamzon, Mediodia, & Catedral)... 159

Identification of microalgae isolated from floating plastics found along Iloilo Estuary and
cultured in CM and F/2 Media (Yeban, Baranda, Antenor, & Sinco).....165

Institutional Partners

Acknowledgement

PREFACE

We are delighted to present to you the second volume of Publiscience, a journal of high school research studies of first-time researchers. This second volume is a continuation of what was started during the previous school year, 2017 to 2018, but now being published by a student-led Editorial Board.

This volume is a compilation of all 29 Science and Technology Research studies of Batch 2019 of PSHS-WVC. Twenty-nine studies under various fields such as agriculture, marine biology, microbiology, chemistry, materials science and engineering, and computer science. It is the culmination of our research journey as students, being an immortalization of all the hard work and effort we have exerted. These studies are the product of the inquisitive minds and curious nature that PSHS scholars embody.

Publiscience Volume 2 is divided into 5 clusters based on the Harmonized National Research and Development Agenda (HRNDA) of the Department of Science and Technology, namely Health, Climate Change, Industry, Energy, and Emerging Technology (IEET), and Agriculture, Aquatic and Natural Resources (AANR) that we further divided into Agriculture/Aquaculture, and Natural Resources. The HRNDA was prepared so that S&T efforts could be of maximum use in the economic and social benefits for the people, as it is aligned with the National Economic Development Authority's *AmBisyon Natin 2040: Matatag, Maginhawa at Panatag na Buhay para sa Lahat*. As this agenda served as a guide to some of the students in the formulation of their research problems, this was used to cluster the research studies. The different studies were categorized into each cluster in terms of where the purpose and application of their results were most aligned to.

Through these articles we hope to stimulate the minds of the reader and help them formulate questions of their own. We also hope that we are able to inspire the young Filipino scientists in taking the first step of finding the untarnished truth and finishing it by having their research published.

EDITORIAL BOARD

DEDICATION

This journal is lovingly dedicated to Masakata Ogawa for inspiring the next generation of young scholars and his untiring promotion of science education.